

September 17, 2008

Sandra Paske
Secretary to the Commission
Public Service Commission
P.O. Box 7854
Madison, WI 53707

Re: Investigation on the Commission's Own Motion
Regarding Innovative Utility Ratemaking Approaches 5-UI-114
that Promote Conservation and Efficiency Programs
by Removing Disincentives that May Exist Under
Current Ratemaking Policies

Dear Ms. Paske:

This represents the response of the Energy Center of Wisconsin to the Briefing Memorandum sent under the Commission staff's September 2 cover letter. We have one correction to the memorandum. In the summary of the Energy Center's comments contained in Appendix B, page 23, the phrase "they do not produce windfalls to utility investors" should read, "they do not *necessarily* produce windfalls to investors." Preventing windfalls, while possible, requires careful incentive mechanism design.

In our comments to the Commission in this docket made earlier this year, we indicated that we were conducting research on the issue of incentives and disincentives for utilities to promote energy efficiency improvements. We promised to share that research with the Commission when it is completed. We are submitting that research in this response. We do not view it as arguing in favor or in opposition to any particular course of action. Rather, it represents a framework that policy makers can use to determine impacts and effects of policy actions and other changes.

If you have any questions, please call Steve Kihm at (608) 238-8276, ext. 131.

Sincerely,



Susan E. Stratton
Executive Director

Attachment

The Energy Center of Wisconsin

***A Financial Framework for
Analyzing Incentives and Disincentives for
Wisconsin Utilities to Promote Energy Efficiency***

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Executive Director

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September 17, 2008

Disclaimer

The views expressed in this paper are those of the Energy Center of Wisconsin, and not necessarily those of any organization affiliated with it.

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1. Overview

This paper provides a framework for analysis of the incentive and disincentives for utilities to promote energy efficiency. While we draw conclusions where they are analytically obvious, we make no policy recommendations. As such, the paper provides a structure that may help policy makers in assessing the reasonableness of policy options related to the impact of energy efficiency efforts on utilities. While our framework is broad-based in nature, we focus the analysis on issues specific to Wisconsin. The thrust is to present a basic structure for analysis that can accommodate the Wisconsin experience.

Our key conclusions are:

- Under current regulatory and financial conditions, there are two primary disincentives that may prevent utilities from promoting energy efficiency improvements aggressively in their service. Such promotion will result in:
 - i. lower short-run earnings due to sales erosion;
 - ii. slower long-run investor wealth accumulation due to slower rate base expansion.
- Decoupling mechanisms address only short-run earnings issue. The long-run wealth accumulation problem may be more important from an investor perspective.
- Wisconsin's regulatory process, with frequent rate cases, future test years, and active oversight, may reduce the need for or effectiveness of decoupling mechanisms.
- Corporate finance principles suggest that one determines investor wealth impacts not by examining impacts on *rates* of return, but rather by

examining *aggregate* net present value impacts. Utility incentives analysis should apply the corporate finance framework.

- Under the corporate finance framework, if authorized rates of return exceed the utilities' costs of capital, as they have in recent times, utilities will have a disincentive to promote energy efficiency programs, even if a decoupling mechanism is in place. Such programs slow the growth in the rate base, which reduces investor wealth accumulation.
- Under the corporate finance framework, if authorized rates of return exceed the utilities' costs of capital, alternative investment opportunities for utilities may need to be identified to make investors indifferent between building plant and promoting energy efficiency.
- Under the corporate finance framework, if authorized rates of return fall below the utilities' costs of capital, utilities will have an incentive to promote energy efficiency improvements instead of adding supply-side assets because under such a condition making capital investments decreases investor value. While this situation has occurred in the past, it is not the most likely scenario going forward.
- Corporate finance principles also suggest that even if the Commission removes investor disincentives related to energy efficiency, utility managerial incentive structures may create a barrier in this regard.
- Natural gas utilities are more likely than electric utilities to embrace decoupling mechanisms. Electric utilities are more likely to prefer investment-based incentive mechanisms.

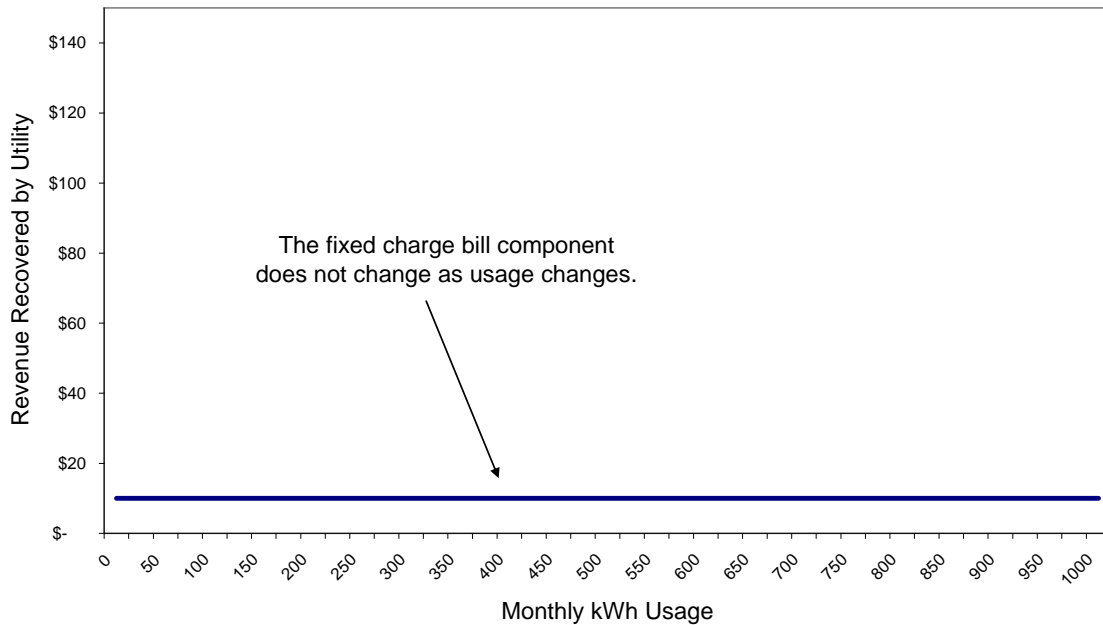
- Decoupling mechanisms are likely to reduce the investors' required return on debt proportionately more than they reduce the investors' required return on equity.
- Not all customers will necessarily benefit from increased utility energy efficiency efforts. The Commission may wish to consider this fact when allocating efficiency-related costs among rate classes.

2. *Key Aspects of Standard Utility Rate Design Related to Energy Efficiency Programs*

To understand the short-run impact of energy efficiency programs on a utility, we must start by discussing key aspects of utility rate design as it is practiced in Wisconsin. Key rate design components include fixed charges and volumetric charges.

The monthly customer fee is an example of a utility fixed charge. For a residential customer this might be \$10 per month. For a large industrial customer, it might be in the hundreds or even thousands of dollars. Focusing only on these charges, whether a customer uses 0 kWh or 1,000,000 kWh, he or she owes the utility the same amount each month. That is to say, the bill associated with these charges is invariant with respect to usage. We see this relationship in the following graph.

Hypothetical Monthly Utility Revenue Recovery
from a Fixed Charge on a Residential Customer's Bill



Therefore, if all utility charges were fixed in nature, the utility would collect the same amount of revenue whether the customer continued to use same amount of energy each month, or if the customer reduced his or her usage by 10 percent, for example, by making energy efficiency improvements.

One way to insulate the utility against the impact of energy efficiency programs, therefore, is to recover more costs on a fixed basis and fewer costs on a volumetric basis. One major problem with such a rate design, though, is that the more costs that are recovered on a fixed basis, the less sensitive the customers' bills are to changes in energy use. This mutes the price signal, which makes energy efficiency less attractive to the customer, as major changes in usage have only limited impacts on utility bills.

We can use the pricing of cable television service as an example to demonstrate this point. The fee for basic cable service is fixed. Therefore, in terms of one's cable television bill, it does not matter whether the customer watches television 1 hour per day or 10 hours per day—the

monthly cable bill is the same in either case. If regulators priced natural gas service in this fashion, it would not matter whether the customer set the furnace thermostat at 60 degrees or 80 degrees during the heating season—the utility bill would be the same. In a world where there is considerable interest in making sure that we encourage consumers to be energy efficient, this is not a desirable result from a public policy perspective.

Of course, the regulator would not have to shift all cost recovery to a fixed-charge basis, but rather could reallocate some costs currently recovered under volumetric charges to a fixed basis. The preceding concern still applies, however, in that the more costs the regulator shifts to a fixed recovery basis, the less the customers' bills decrease when they become more efficient, and the less those bills increase if the customers use energy in a wasteful fashion.

Conversely, if regulators wished to send the most effective price signal for customers to use energy efficiently, they would recover all costs via volumetric charges. That is, all charges would be related to the customer's usage. If the customer used no electricity or natural gas in a given month, his or her utility bill would be \$0 under an all-volumetric rate design.

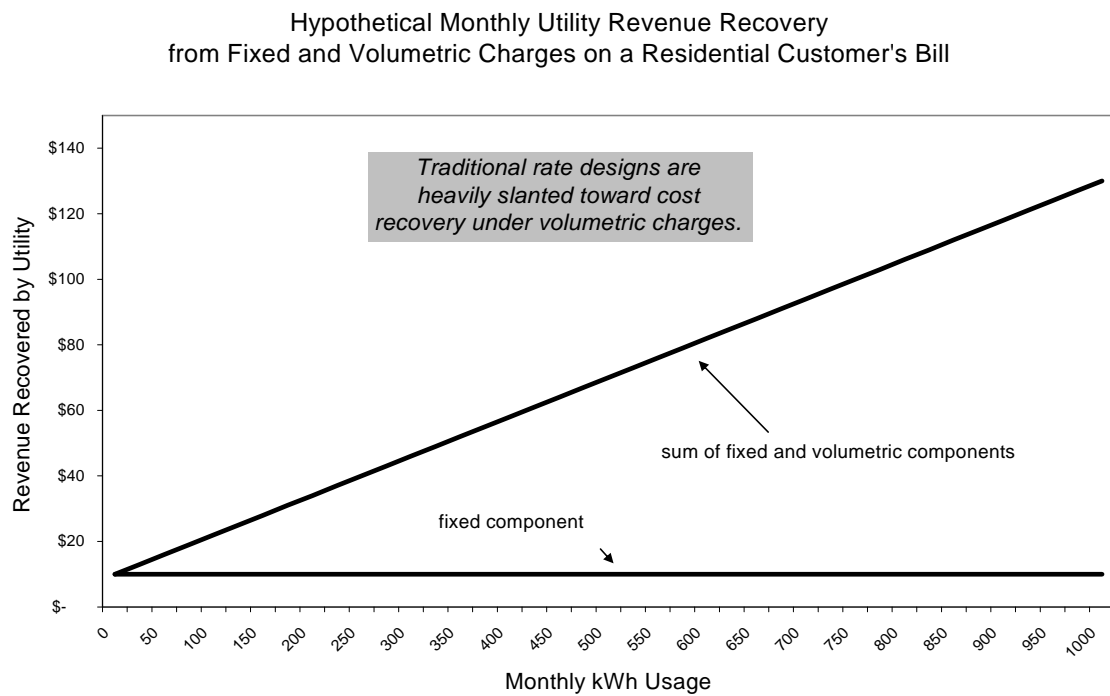
Under such a rate design, the customers' bills drop noticeably as they make energy efficiency improvements, and they increase noticeably if the customer begins to use energy in a wasteful fashion. There are, however, some problems with this rate design as well. One is administrative.

If all costs are charged on a volumetric basis, then customers may request to have the utility extend new electric service for very small loads, such as for sheds and other outbuildings. Such extensions tend to be cost-inefficient for utilities, and, in the end, other ratepayers subsidize the small usage extensions.

For a variety of reasons, the discussion of which is beyond the scope of this analysis, in practice, regulators tend to allow recovery of only a portion of the utility's fixed costs through monthly customer charges, and allocate the remaining fixed costs, along with all the variable costs, to volumetric-based charges. While this sends a noticeable price signal to the customer that

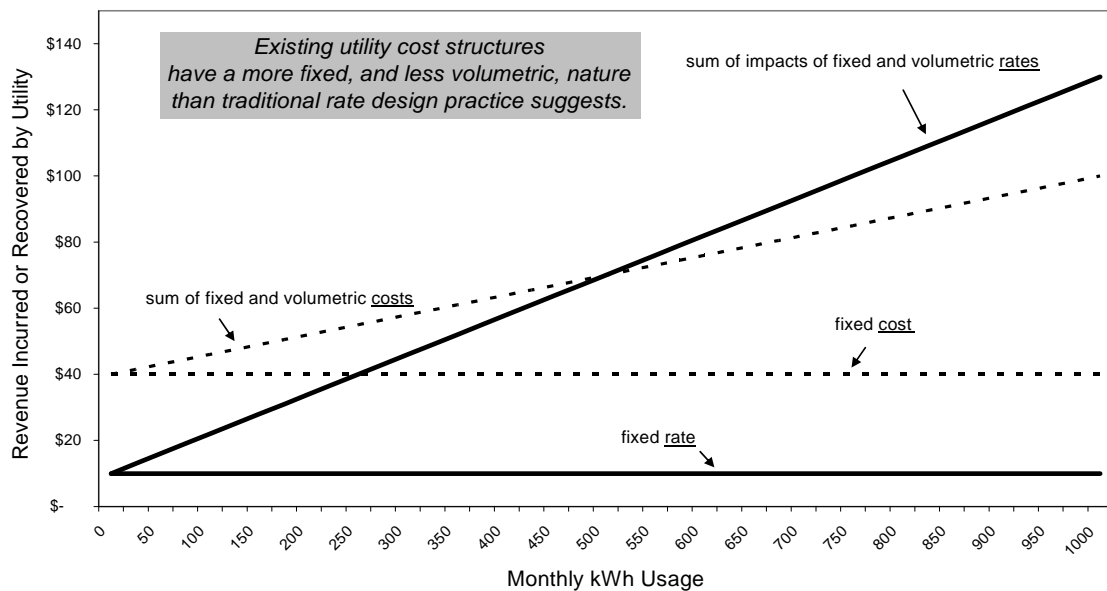
reducing usage will lower bills, it creates revenue recovery problems for the utility when customers do make efficiency improvements.

The effect of the traditional combination of hypothetical fixed and volumetric charges on residential customers' bills is shown in the following graph:



The following chart contrasts the rate design (solid lines) with the underlying cost structure (dashed lines).

Comparison of Hypothetical Monthly Utility Cost Structures and Rate Designs



This is where the problem with energy efficiency occurs. The regulator wants to send a price signal encouraging ratepayers to use energy wisely. To do so, the regulator loads some fixed charges into the volumetric rate. In so doing, however, when the customer makes energy efficiency improvements, the customer's bill declines by more than the amount of cost that the utility avoids. On net, the utility loses the contribution to fixed costs that the regulator rolled into the volumetric charge.

3. *Short-Run Impacts of Energy Efficiency Programs on Utility Finances*

The rate design issue just discussed leads to *short-run* financial problems for utilities when customers make *unanticipated* energy efficiency improvements. We have highlighted the terms "short-run" and "unanticipated" in the previous sentence to acknowledge the fact that: (1) the ratemaking process adjusts for revenue losses due to changes in sales growth over the long run; and (2) if the regulator actively oversees the utilities it regulates and it forecasts that energy

efficiency improvements will be forthcoming when it sets the rates, then the impact of *expected* energy efficiency efforts will have been adjusted for upfront.

We will address the difference between short-run and long-run financial impacts in a moment. For now, we will focus on the issue of forecasting energy efficiency improvements in the ratemaking process.

Assume for the moment that when it sets the utility's rates, the regulator understates the degree to which customers will make energy efficiency improvements. Every kWh that the customers avoid when they make those unanticipated energy efficiency improvements reduces customer bills by an amount greater than the variable costs the utility avoids. *If all other factors remain the same*, these revenue shortfalls flow to the bottom line in terms of reduced utility earnings. This in turn lowers the utility's earned rate of return on equity (return on equity).

As we will discuss in a moment, it is a poor assumption that everything necessarily will remain the same when utilities undertake aggressive promotion of energy efficiency programs. Furthermore, it is a poor assumption that the impact on the return on equity is necessarily a good indicator of the investor impact of energy efficiency programs, as we also explain later in the paper.

For now, though, let us hold all else equal and let us focus on the return on equity impact of energy efficiency programs. If this is a problem, there are several ways that regulators can address the issue. One approach that has received much attention as of late is utility revenue decoupling.

Under such a procedure, the regulator implements a true-up mechanism that operates between rate cases so that the utility is made whole for net revenue shortfalls associated with energy efficiency programs. Decoupling mechanisms need to operate only between rate cases because the standard rate case process itself adjusts on a going-forward basis for impacts of energy efficiency programs on utility sales, and on the utility's rate of return.

That is, if one utility is selling less energy than its neighbor because the former utility promotes energy efficiency while the latter utility does not, then the regulator will set the former utility's rates so that it can earn the same rate of return as does its neighbor, even though the sales growth rates for each utility differ. If each utility continues on its prior sales trajectory, with the efficiency seeking utility growing slowly while the less-efficient neighboring utility grows more rapidly, if rate review is frequent as it is in Wisconsin, there will be little difference between the utilities' earned rates of return.¹

Let us return our attention to the period between rate cases where the decoupling mechanism takes hold. Such mechanisms come in various shapes and sizes. In some cases, the decoupling mechanism makes the utility whole for net revenues lost due to any reason, including not only due to energy efficiency programs, but also due to factors such as unexpected weather patterns, or unexpected economic conditions. Decoupling mechanisms are typically symmetric in that if the utility sells more energy than it expects, rather than less, it must refund to customers any extra net revenue garnered from sales that were higher than the regulator expected when it set the utility's rates.

The impact of a decoupling mechanism on a utility's earned rate of return is a function of the time between rate cases. If the time period is long, say 5 to 10 years, decoupling mechanisms can have a major effect in this regard.

Wisconsin utilities, though, face biennial rate reviews. They also are subject to active oversight by the Commission. Thus, we do not have a passive regulator that sets a utility's rates once a decade and then lets the utility operate as it sees fit. This bears on the need for a decoupling mechanism.

¹ On the other hand, if the period between rate cases much longer than it is in Wisconsin, say 10 years instead of 2 years, for example, then the effectiveness of the rate case process in adjusting for energy efficiency programs will be limited. The problem is then not with the rate case process, but rather that the regulator in this example is choosing not to use it with the frequency necessary to make it effective in this respect.

Under the Wisconsin regulatory regime, the Commission can reflect energy efficiency activities in the sales forecast. If it misses the mark in that regard, it can correct for that error fairly quickly on a going-forward basis by adjusting the sales forecast in the next rate proceeding. The revenue shortfalls associated with energy efficiency programs then can be attributed to forecast error, one that can be corrected fairly quickly, rather than creating systematic problems for the utility.

Some economists have argued that, even if there is frequent rate review, utilities always have a disincentive to promote energy efficiency programs between rate cases. This view suffers from one important defect—it fails to acknowledge the dynamic actions of an active regulator.

The economists' argument assumes that the utility will not pursue energy efficiency programs aggressively, even if the Commission orders the utility to do so when it sets the utility's rates. There is a *quid pro quo* associated with the regulator including the effects of energy efficiency efforts in the sales forecast. This provides a fair opportunity for the utility to recover its fixed costs given an anticipated level of energy efficiency. To continue to receive such consideration from the regulator, the utility must act in good faith to attempt to achieve the energy efficiency goals established in the rate case.

It is unreasonable to assume that a Wisconsin utility would tell the Commission that it is going to promote energy efficiency improvements within its service territory, and then act to subvert those goals. The Commission would not likely act favorably toward the utility when it set its rates in the next rate proceeding. Put another way, the Commission can do a lot more damage to the utility's bottom line under its frequent rate review process than the utility can likely achieve by attempting to subvert the Commission's policy directives.

Regulatory enforcement tools involve not only lowering a recalcitrant utility's return on equity, but also less obvious, but equally effective measures such as increasing the utility's sales forecast, or disallowing certain utility expenses. This is where the frequent rate case cycle and

active regulatory oversight may be able to keep the utility on the efficiency-seeking path, regardless of whether a decoupling mechanism is in place.

That is not to say that a decoupling mechanism should never be used in Wisconsin. It is to say that before the Commission implements such an approach, it would be helpful to consider whether its current practices of frequent rate review and active oversight might achieve approximately the same end.

4. *Long-Run Utility Investor and Managerial Incentive Structures*

Considerable attention has been given to the short-run impacts of energy efficiency programs on utility finances, which is the topic we just discussed. Less attention has been given to the long-run financial impacts of those programs.

Over the long run, energy efficiency programs reduce the rate of growth in the utility's rate base. Under current regulatory practices, this may create bigger financial concerns for utility investors than the short-run impact of energy efficiency programs on utility's rates of return. This long-run effect holds whether or not decoupling mechanisms are in place, or if rate reviews are frequent. Decoupling mechanisms and the rate case process address the issue of how energy efficiency programs affect rates of return. The rate base issue is one of investment *scale*, not percentage returns. Financial principles suggest that under most circumstances both scale and rate of return are important to investors.


Other analyses of the financial impact of energy efficiency programs on utilities often focus solely on the utility's earned rate of return, as the indicator of investor impact. Such reviews assume that investors necessarily will prefer actions that produce a higher return on equity to those that produce a lower return. To make a utility indifferent between alternatives, according to this logic, one need merely equate the rates of return.

Such an assumption is not consistent with corporate finance principles. When a firm is choosing between mutually-exclusive alternative strategies (*e.g.*, whether a utility should adopt a

supply-side-focused resource acquisition plan or whether it should instead pursue energy efficiency resources more aggressively), *investors will prefer the strategy that maximizes the aggregate net present value of the cash flows, and not necessarily the one that maximizes the rate of return.*

This is a fundamental proposition of corporate finance. It is so critical that Brealey, Myers, and Allen’s *Principles of Corporate Finance* spends an entire chapter on this subject, under the heading “Why Net Present Value Leads to Better Investment Decisions than Other Criteria.”² As the authors note in the simplest of terms, when one must choose between two mutually exclusive paths, those who use choose the project with the net present value rule will get richer than those who rely solely on rates of return to make the choice.

A simple example can illustrate point. If the investors’ required return is 10.0 percent, and if the projects shown below are mutually exclusive, which investment will the investors prefer that the firm adopt? We will assume for the sake of analytical simplicity that the strategies each involve the firm making a single upfront lump sum investment that will in turn generate a perpetual stream of annual cash earnings.

Strategy	Upfront Investment	Annual Realized Cash Earnings	Annualized Realized Rate of Return
Rapid expansion	\$2,000,000	\$215,000	10.75%
Moderate growth	\$1,000,000	\$110,000	11.00% 

If one believes that investors focus on rates of return, the moderate growth strategy seems like the better choice, as suggested by the arrow in the last column.

That, however, is the wrong answer according to the tenets of financial analysis. To calculate the preferred choice, we need the net present values of the investment streams. The following formula provides the present value of a perpetual stream of cash:

$$PV = \frac{CF_1}{k}$$

² Richard A. Brealey, Stewart C. Myers, and Franklin Allen, *Principles of Corporate Finance*, McGraw Hill-Irwin (2006), p. 96.

Where:

PV = present value

CF_t = annual cash flow


k = investors' required return

We calculate the net present value by subtracting the upfront capital investment (I) from the present value of the future cash flows, as follows:

$$NPV = PV - I$$

We obtain the net present value of the cash flows for the two strategies set forth in the table above by solving the following equations:

- Rapid expansion (which has the lower rate of return of 10.75%):

$$NPV = \frac{\$215,000}{0.10} - \$2,000,000 = \$150,000$$


- Moderate expansion (which has the higher rate of return of 11.00%):

$$NPV = \frac{\$110,000}{0.10} - \$1,000,000 = \$100,000$$

As the arrow above indicates, the investors' preferred choice is that the rapid expansion strategy because it maximizes *aggregate* investor wealth, even though it has a lower *rate* of return.

Note that the net present value calculation considers internally not only the rate of return on the investment, but also the scale of the investment, as well as the investors' required return. Therefore, under proper financial analysis, *the rate of return is an input to the value creation process, not the goal.*

The net present value model can be summarized as follows. The net present value result is directly related to changes in the earned rate of return, and inversely related to changes in the investors' required return. The relationship of the scale variable to the net present value result is more complicated, as it depends on the relationship between the two other variables. If the rate of return exceeds the investors' required return, then the net present value result is directly related to

changes in investment scale. On the other hand, if the rate of return is less than the investors' required return, then it is inversely related to scale changes. If the rate of return equals the investors' required return, then the net present value result is unaffected by changes in investment scale.

This should give pause to those who suggest that the regulators necessarily can remove the disincentive for utilities to promote energy efficiency by merely ensuring that the utility's rate of return remains unaffected when it promotes energy efficiency programs. We just showed that it is possible that, even if the rate of return on the smaller scale project is *higher* than that of the larger scale investment, if the difference in scale is large enough, it can trump the difference in the rate of return. That is not to say that scale always wins out—it is the interaction between the rate of return, the project's scale, and the required return that drive the net present value result, as we just discussed. Our point here is that focusing only on the rate of return, which most people do when discussing the financial impact of energy efficiency programs, ignores the fact that the two other key variables are also relevant in this regard.

Applying the net present value framework in a conceptual way, we note that if the rates of return and the required return on two projects of different scale are the same, and the investor must choose between them, then investors will always prefer the larger-scale project. This suggests that if the rate of return and the investors' required return both are held constant, under normal conditions utility investors tend to have a bias in favor of the larger-scale rate base that results from supply-side resources, as opposed to smaller-scale rate base that results when the utility promotes energy efficiency improvements.

The net present value analysis hinges critically on the relationship between authorized returns on equity and the investors' required return. If regulators typically allow utilities to earn returns in excess of their costs of capital, which Kahn, Myers, and numerous others have found to

be the case,³ then under a given rate of return, the strategy that maximizes net present value is to add as much capital to the rate base as possible. The economics and finance literature refers to this preference for capital expansion in the utility industry as the A-J effect, in recognition of economists Averch and Johnson who identified this characteristic in the early 1960s.⁴

This suggests that when operating under normal regulatory conditions, utility shareholders have a financial interest in seeing their firms grow as fast as possible. High rates of sales growth beget greater capacity expansion, which is what ultimately produces the net present value gains for investors.

The key to utility investor wealth accumulation, therefore, under today's conditions, is to for utilities to build. We observe the manifestation of the investor desire for utility capital expansion set forth in contemporary utility investment analyses, such as the following report on American Electric Power Company contained in a recent issue of *The Value Line Investment Survey*:

*Capital spending, followed by rate relief, should continue to be the key driver of American Electric Power's earnings growth.*⁵ (Emphasis added.)

The corporate finance literature also suggests that, even if conditions change so that rate base expansion does not benefit investors (which we will discuss in a moment), utility managers tend to continue to have a private incentive to make capital additions. Executive salaries and managerial prestige relate more directly to the size of the firm, and not necessarily to investor wealth accumulation. We will discuss this issue further later in the paper.

Note then that energy efficiency programs work against this joint investor-managerial preference for expansion by slowing utility sales growth, which in turn slows the rate of capacity additions. Therefore, under normal regulatory conditions, if the utility is to be made whole when

³ Alfred Kahn, *The Economics of Regulation*, John Wiley & Sons (1988); and Myers, S.C., and L.S. Borucki, 1994, Discounted cash flow estimates of the cost of equity capital—a case study, *Financial Markets, Institutions, and Instruments* 3, 9-41.

⁴ Harvey Averch and Leland Johnson, "The Behavior of the Firm Under Regulatory Constraint," *The American Economic Review*, Volume LII (1962).

⁵ *The Value Line Investment Survey*, December 28, 2007.

it ramps up energy efficiency efforts, it must be compensated for the associated lost supply-side investment opportunities, or *lost assets*, that result from such efforts. Ratemaking procedures that make utilities whole for the *lost revenues* associated with energy efficiency programs, such as decoupling mechanisms, do not address the long-run loss of rate base scale associated with energy efficiency efforts, and therefore may be less effective in changing corporate strategies than many believe will be the case.

The upshot is critically important: under normal conditions, utility investors and managers tend to have an incentive to expand their firms' rate bases by adding supply-side investments, whether or not a decoupling mechanism is in place. Put another way, on net, because they ignore long-run changes in the scale of the rate base, decoupling mechanisms do not remove the full disincentive associated with energy efficiency programs, either from an investor or from a managerial perspective.

5. *Possible Changes in Regulatory and Financial Conditions*

The preceding conclusion depends in part on the A-J effect being in force, *i.e.*, that authorized rates of return continue to exceed costs of capital. This is the standard relationship that has held for much of the past half century in the utility industry.

The analysis takes a different twist, however, if conditions change so that utility rates of return are at or below utility costs of capital, such as was the case in much of the 1970s and early 1980s. For example, if the cost of capital is 12.0 percent, instead of 10.0 percent in our prior example, then the net present values of our two expansion strategies are:

- Rapid expansion (which has the lower rate of return of 10.75%):

$$NPV = \frac{\$215,000}{0.12} - \$2,000,000 = -\$208,333$$

- Moderate expansion (which has the higher rate of return of 11.00%):

$$NPV = \frac{\$110,000}{0.12} - \$1,000,000 = -\$83,333 \quad \nwarrow$$

Note that both strategies produce negative net present values because the rates of return of both are lower than the cost of capital. This suggests that if the firm can avoid undertaking either strategy, it should do so. If it must choose one or the other, however, as the arrow suggests, the moderate growth strategy is now definitely preferred. It does less damage to investor wealth than does the more rapid expansion strategy. We could protect investors even more if we could shift to a no-growth, no-investment strategy under these conditions. When rates of return lie below the cost of capital, as a general rule, we want to invest as little capital as possible to limit investors' market losses.

The key question in this regard is whether it is likely that we will continue to live in a world in which allowed rates of return exceed utility costs of capital, or whether we will return to a world where utility capacity additions create financial problems for utilities. If the former case holds, the fact that energy efficiency programs deprive utilities of more rapid rate base expansion is likely to create a financial disincentive for utilities to promote efficiency aggressively. On the other hand, if we return to the conditions described in the latter scenario, utilities may embrace energy efficiency programs as means of reducing the need to raise capital under adverse conditions.

It has been decades since we experienced conditions in which rates of return regularly lied below costs of capital. It is fair then to ask how likely it is that we will experience such conditions in the future. It seems unlikely that the Wisconsin Public Service Commission would adopt unilaterally a rate-of-return policy shift that would bring about such a change. Such an action would drive utility stock prices to book value or below, which for MGE Energy, for example, would amount to at least a 40 percent loss in its current market value.

Rather, as was the case in the 1970s, it is likely that such a dramatic change would result from external forces. If utility costs of capital rise dramatically due to increased rates of interest

and inflation, if history is our guide, then authorized rates of return will not necessarily keep pace with those changes. When economic conditions are dire, the political pressure to limit rate increases is high. Utilities in general fare poorly under such conditions and those that attempt to raise capital in that environment fare the worst.

We are not forecasting a return to the high-inflation, high-interest-rate environment experienced in the 1970s, although we acknowledge that such a result is clearly possible. What we believe is more likely to contribute to adverse financing conditions in the utility industry are those that could flow from the financial markets and Wall Street in the form of risk-adjusted investor return requirements. Investment bankers today suggest that the financial markets now view utilities that focus on meeting customer demand growth with supply-side assets as more risky than those that pursue energy efficiency resources along with supply-side resources.⁶ That could affect the relationship between authorized returns and the underlying costs of capital for utilities, and, as such, could affect utility incentives as they relate to building supply-side facilities.

6. *Overview of Financial Conclusions*

The bottom line of this analysis is that, if in the future, regulators continue to allow utilities to earn returns in excess of their costs of capital, which many regulatory experts suggest they should, utilities in general will continue to have a financial interest in expanding their rate bases. If regulators find that utilities should be key players in promoting energy efficiency improvements, then under traditional regulatory rate-of-return policy we have a conflict between public interest goals and utility financial incentives.

If regulators are to resolve this conflict, effective mechanisms that address this problem will need to address the effect of reduced rate base scale associated with lost supply-side asset opportunities that result from energy efficiency programs with some other form of investment

⁶ See www.carbonprinciples.org

possibility. Mechanisms that address lost revenues are likely to be ineffective in removing this long-run scale-related disincentive, as they provide no compensation to the utility for the supply-side investments it does not make when demand-side resources replace supply-side resources. If, on the other hand, regulatory and financial market conditions change to the point where authorized returns do not exceed the costs of capital, , then there may be less of a problem in persuading utilities to pursue energy efficiency resources under current ratemaking practices.

7. *Managerial Incentives*

So far, we have focused on the investor perspective. As we noted earlier, managerial interests may not track investor interests completely, as corporate managers in general historically have tended to have an incentive to pursue more basic, growth-based strategies under nearly all financial environments, something that cannot be said for investors. This had been especially true in the utility industry where, even in the face of the adverse financial conditions experienced in the 1970s, utility executives had in some cases held out maximizing sales growth as the overarching corporate goal.⁷

The reader should not assume that we are suggesting that the mismatch between investor and managerial incentives will cause utility managers to ignore investor interests in favor of their own. Rather, we suggest that the complex web of interactions inherent in a modern corporation creates a challenge for those who attempt to predict precise managerial behaviors. The following quote, which is from *Principles of Corporate Finance*, echoes our view on this issue:

*In most firms, managers and employees coinvest with stockholders and creditors—human capital from the insiders and financial capital from outside investors. So far we know very little about how this coinvestment works.*⁸

Therefore, since managers respond to cues that are somewhat different from those that motivate investors, it may be helpful to consider ways in which the Commission might address managerial

⁷ See Mark Hirschey and James L. Pappas, “Regulatory and Life Cycle Influences on Managerial Incentives,” *Southern Economic Journal*, Oct. 1981.

⁸ Brealey, Myers, and Allen, *Principles of Corporate Finance*, McGraw-Hill Irwin (2006), p. 964.

interests if it finds that the utilities should promote energy efficiency more aggressively than they have in the past.

Along these lines, we note that there may be a culture change occurring in society, one that affects utility executives' views on energy efficiency. Utility executives today are likely quite different from their sales-maximizing counterparts of several decades earlier. In today's carbon-constrained world, being an environmentally conscious, or green, corporate leader may have considerable cachet within the executive community. It also is likely to be a politically astute view.

If that is the case, then it is possible that some utility executives will be out front on the issue of promoting energy efficiency, rather than seeing it as a threat. Nevertheless, given that some of the appeal of energy efficiency resources is likely psychological in nature, it is conceivable that some utility executives may view energy efficiency resources in a more favorable light than do others.

8. *Differences Across Utility Industries*

The significance of the disincentive to promote energy efficiency is not necessarily the same in the natural gas utility industry as it is in the electric utility industry. This flows from the basic differences in the industries.

Electric utilities are capital intensive. Over the past several decades, their loads tended to grow at about 2 to 3 percent per year. Natural gas utilities costs are much more variable in nature, with the lion's share of a natural gas utility bill being comprised of the cost of the natural gas commodity. Furthermore, natural gas utilities today, in general, sell about the same amount of natural gas as they did in the early 1970s, suggesting that the industry is for all intents and purposes in no-growth mode.

The key difference from a finance perspective is the difference in capital intensiveness. As we discussed earlier, under normal conditions, net present value gains flow from capital

expansion, with the larger the scale of the expansion, the greater the net present value gains. Expecting natural gas utilities to accept reductions in sales-growth-related rate base expansion is one thing, but, under current regulatory arrangements, expecting electric utilities to follow suit is another matter. As we demonstrated, even if we hold constant an electric utility's rate of return when it promotes energy efficiency improvements, unless we compensate the utility for the resulting lost supply-side assets, utility investors would be worse off under an efficiency seeking strategy than they would be under a supply-side-only expansion strategy.

It is interesting to note that while several jurisdictions have adopted decoupling mechanisms for natural gas utilities, far fewer have done so for electric utilities. That is likely due to more than coincidence. Since decoupling does nothing to compensate utilities for lost supply-side investment opportunities, an electric utility that promotes energy efficiency is not made whole if it agrees to promote energy efficiency in exchange for a decoupling mechanism.

This has led to alternative incentive mechanisms that provide investment opportunities for electric utilities. Most notable is Duke Energy's Save-a-Watt program. Under this approach, much of the avoided cost benefits from energy efficiency programs flow to investors as compensation for the lost supply-side investment opportunity. While we do not necessarily endorse all of the numerical aspects of the proposal, such as allowing the utility to retain 90 percent of the costs it avoids, we do find the Save-a-Watt program to be in principle consistent with overarching financial concepts. The Save-a-Watt proposal provides the utility with a real investment alternative to supply-side investments, which addresses the issue of the long-run change in the rate base scale.

Natural gas utilities may be satisfied with a decoupling mechanism because most of their rate base expansion is small in scale, and often related to existing system upgrades, rather than to sales growth. In other words, much of a natural gas utility's rate base investment continues whether or not overall load grows. In the natural gas industry, there is no analog to the massive scale of a 1,000 MW electric utility power plant addition that becomes necessary to meet ever-

growing electric system load growth. Rather, in the natural gas industry, it is more about incremental system upgrades to maintain safety and reliability, and not about massive, growth-related rate base investments.

Thus, energy efficiency programs do not cost natural gas utilities nearly as much in the way of lost growth-related investment opportunities. Since the scale issue for natural gas utilities is not as critical, they may focus more on the rate of return. Therefore, it seems then that decoupling mechanisms, which also focus on the rate of return, may be an easier sell in the natural gas industry. On the other hand, scale is a variable of keen interest in the electric utility industry. Therefore, electric utilities may favor investment-based mechanisms over decoupling approaches.

9. *Changes Utility Risk Profiles Under Alternative Ratemaking Mechanisms*

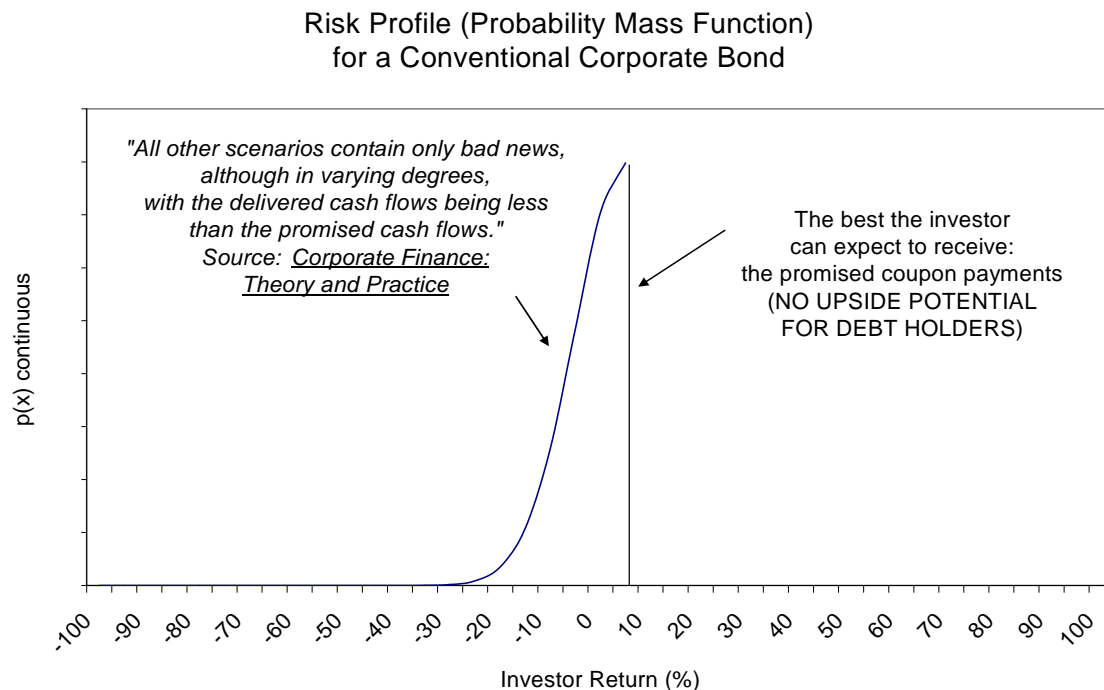
Until now, we have lumped bondholders and stockholders into a single category referred to as investors. To determine how changes in ratemaking practices would affect investors, we now need to make a distinction between these investor types. Due to fundamental differences in the nature of those securities, risk propagates differently to each group. In either case, the risk issue is complex and often counterintuitive.

Let us begin with debt securities. Such securities have an interesting feature—there is mostly downside risk, and little upside risk, associated with them. Consider the following quote from Damodaran's *Corporate Finance: Theory and Practice* that discusses the asymmetric risk profile associated with conventional corporate bonds:

*The coupons [interest payments] are fixed at the time of issue, and these coupons represent the promised cash flow on the bond. The best case scenario for you as an investor is that you will receive the promised cash flows; you are not entitled to more than these cash flows even if the company is wildly successful. All other scenarios contain only bad news, although in varying degrees, with the delivered cash flows being less than the promised cash flows.*⁹

⁹ Aswath Damodaran, *Corporate Finance: Theory and Practice*, John Wiley & Sons (2001), p. 175.

Thus, the expected cash flows to the bondholder have a peculiar shape, with the upside potential truncated at the level of the promised payment, while the downside potential includes the entirety of the number range down to a 100 percent loss (*i.e.*, total loss of capital).

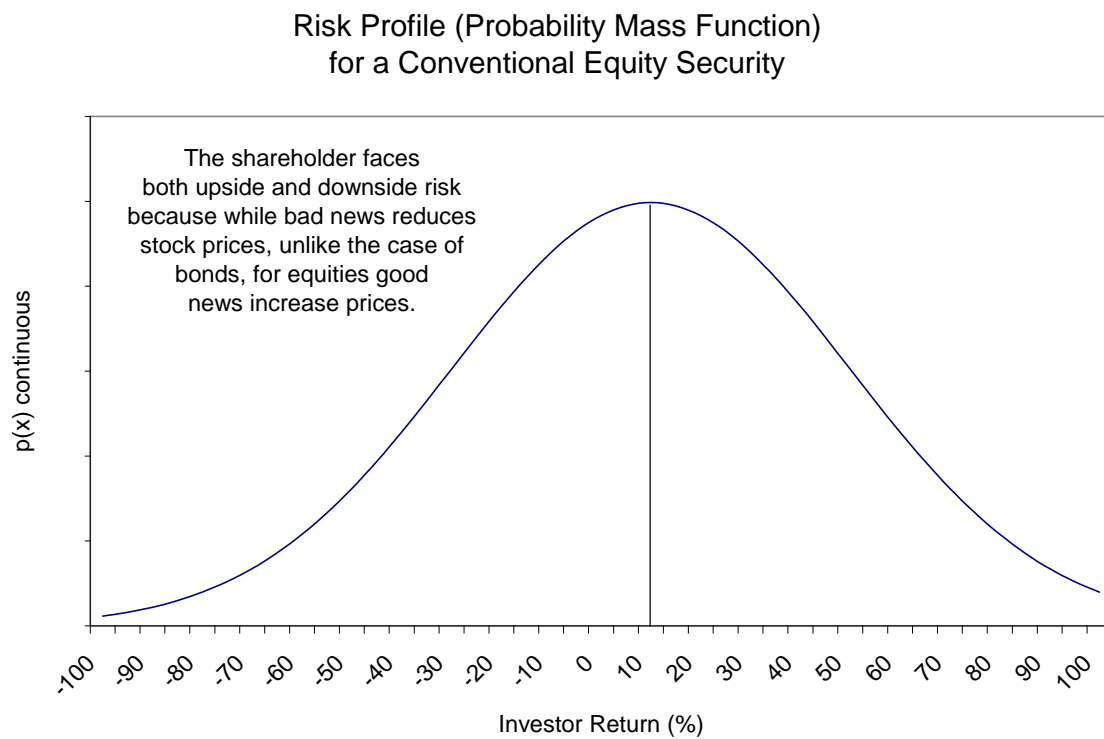


Although it may not be obvious at the outset, this risk profile limits to a noticeable extent the effectiveness of portfolio diversification for bondholders. If the return distribution were symmetric, then good results at some companies could offset bad news at other companies. That is what happens in stock portfolios, as we will discuss in a moment. But for bonds, all the benefits of good news accrue to the shareholders, while the bondholders share to some extent in the bad news. In other words, in a bond portfolio, the good news for one company does not help its bondholders, while the bad news for another company could hurt its bondholders.

Note, however, that all is not as bleak for bondholders as it might seem. If the bondholders find themselves in an investment return deficit, the news is likely much worse for shareholders. Bondholders get first claim on the company's cash flows, so if the bondholders receive less than their promised share of cash, then there is nothing left for shareholders.

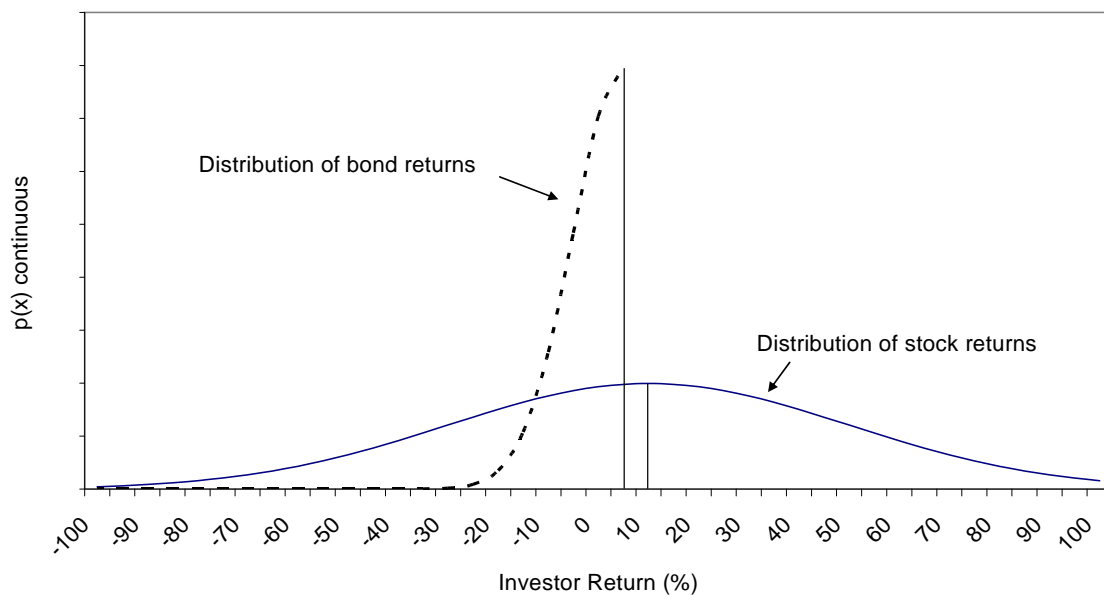
The upshot of this asymmetric return profile for bonds, and the fact that it makes portfolio diversification somewhat ineffective, is that all the risks that the utility faces can affect bond holders' required returns. The higher the total risk of the firm, the higher the bondholders' required return. *As a result, any ratemaking adjustment that reduces risk for the utility in turn reduces the bond holders' required return.*

That is not the case for shareholders. They face more symmetric risk profiles, as is shown below:



Note that while the risk distribution is symmetric for the shareholder, it is also much more variable than it is for the bondholders. This is shown below, as we present both distributions on the same chart:

Risk Profile (Probability Mass Function) for a Conventional Debt and a Conventional Equity Security



So how does risk affect required returns on equity investments? Because equity investors can benefit from portfolio diversification much more than can bondholders (for stocks, good news does cancel out bad news), much of the equity investors risk can be diversified away in a portfolio. As a result, *the only factors that affect the required return for shareholders are those that affect all stocks in the portfolio, i.e., the systematic risk factors*. It turns out that all of the systematic risk factors are macroeconomic in nature, such as sensitivity to unexpected changes in interest rates. It is therefore the sensitivity to unexpected changes in only a few macroeconomic factors that determine required returns for all stocks. (Note one should not then conclude that because the risk factors are the same for all stocks the required return is also the same for every stock. Different companies have *varying degrees of sensitivity* to the macroeconomic factors, and investor required returns therefore vary accordingly, even though the risk factors are the same.)

The remaining, non-macroeconomic, risks are firm specific, or industry specific. They affect utility stock prices not by changing required returns, but by altering investor cash flow

expectations.¹⁰ This leads to an interesting conclusion. *Since energy efficiency activities are for the most part not related to changes in macroeconomic conditions, and since only macroeconomic-related changes drive the equity holders' required return, adjusting utility cash flows to make cash flows insensitive to the utility's energy efficiency efforts is not likely to affect the required return on the utility's stock.* Since bondholder returns are driven by all risk factors, however, insulating the utility from impacts of energy efficiency programs will likely lower the required return on the utility's debt.

Therefore, debt holders are likely to see a proportionately larger risk reduction under decoupling than are equity holders. The Commission need do nothing to reflect this reduced bondholder risk as the market provides observable required returns on debt securities. Since many of the risks that decoupling mechanisms eliminate are not macroeconomic in nature, the reduction in the required return on equity that results when decoupling is implemented is likely smaller than many people suggest.

We must also remember that setting the authorized return on equity is a policy determination. The return on equity and the cost of equity (investors' required return) are distinct concepts. The return on equity is set in consideration of factors in addition to the required return on equity. As such, the Commission might decide not to adjust the return on equity at all if a decoupling mechanism is implemented. As with other matters of regulatory policy, we take no position on this matter.

10. *Customer Impacts Associated With Ratemaking Changes*

As is the case with most ratemaking policy changes, the impacts of possible ratemaking changes related to creating incentives for utilities to pursue energy efficiency are not necessarily distributed evenly across customer classes, or across individual customers within a class. The key

¹⁰ See, Brealey, Myers, and Allen, *Principles of Corporate Finance*, and Damodaran, *Corporate Finance: Theory and Practice*.

factors that determine whether a customer benefits or suffers under the possible changes are whether: (1) the customer has already implemented cost-effective energy efficiency measures; (2) the utility or a third party offers programs in which the customer can participate; and (3) the ratemaking mechanism shifts responsibility for costs formerly recovered by other customers to the customer in question.

We assume that if the Commission implements a decoupling mechanism, for example, there will be an associated ramping up of energy efficiency efforts, either on the part of the utility, Focus on Energy, or both. If a customer has not implemented energy-saving measures, the increased emphasis on energy efficiency increases the likelihood that such a customer will participate in one of the programs. Those customers that do are likely to be net beneficiaries of the potential policy shift in this regard, as they will experience utility bill savings as a result.

On the other, if the customer has already implemented most of the possible cost-effective energy efficiency measures, if no energy efficiency programs are offered to the customer, or if the customer has cash constraints that prevent it from spending any money on energy efficiency measures, the short-run impact of such a policy shift will likely be negative. If the Commission implements a decoupling mechanism, for example, some of the utility revenues lost when other customers make energy efficiency improvements will be shifted to these customers who cannot take advantage of the efficiency programs. As a result, these non-participating customers will see their usage stay about the same while the utility rates they must pay will increase. Thus, their utility bills will increase in reaction to the policy shift.

A fundamental question exists as to whether particular customers have implemented all cost-effective energy efficiency measures. Some industrial customers, for example, may claim that they respond to market prices and make cost-effective energy efficiency improvements in keeping with those prices. That is a reasonable assertion. A point of disagreement can arise, however, as to how one determines cost effectiveness. If one changes the definition of cost

effectiveness, new efficiency opportunities might appear. That does mean, however, that customers would necessarily agree with that assessment.

Customers typically use payback periods (*e.g.*, the energy efficiency measure must pay for itself via energy bill savings within 2 years of implementation), while utilities are more likely to use net present value analysis for that purpose. Long-lived energy efficiency measures, such as those associated with building shell improvements, can have paybacks of 10 years or more (which makes them cost ineffective to the customer) and still generate a positive net present value results (which makes them cost effective from the utility's perspective). It would be difficult for the Commission to resolve this impasse since each party is free to define cost effectiveness from its perspective.

This does, however, create a situation where the cost-effectiveness of supply-side investments is evaluated under one method, *i.e.*, net present value analysis, while cost-effectiveness for certain demand-side resources is evaluated using the generally more-stringent payback approach. If this condition persists, utility resource plans will be biased toward supply-side resources. This *could* lead to rate increases that may be greater than those that would result if demand-side resources faced a more-level playing field. Thus, the customers who use the payback method may, in the end, see utility rate increases that are greater than they might have been had customers in their situation used a broader definition of energy efficiency. While we can identify this possibility, it is difficult to determine precisely how this will play out in the future.

Assuming for the moment that some customers have implemented all cost-effective measures, then we have identified a group of customers that will be harmed, at least in the short-run, by an increased emphasis on energy efficiency. The situation is clearer if there are no energy efficiency programs in which the customer can participate, or if the customer has no funds to make any energy efficiency improvements. As to the latter situation, unless the utility implements a direct-install program, in which the utility pays for the entire cost of the efficiency measure, such customers will not be able to participate, even if other utility programs are available. These

customers will bear some of the costs associated with other customers' efficiency improvements in the form of increased utility rates, while their usage will remain the same. Again, therefore, their utility bills will increase.

While the Commission can make sure that programs are offered to customers in all sectors, it cannot be sure that every customer can or will participate in the programs. As a result, it is likely that some customers may be harmed in the near-term by an increased push to obtain energy efficiency resources. Whether these same customers would be harmed over the long term is more difficult to discern as the long-run impact depends to a large extent on the degree to which energy efficiency programs limit future utility rate increases.

Some regulators have attempted to resolve this potential fairness issue by implementing decoupling mechanisms that apply to some classes, where energy efficiency opportunities appear to be the greatest, and not to other classes where such opportunities appear to be more limited. There are also some administrative details that in some cases can make such an approach more workable than system-wide decoupling. For example, if the decoupling is done on a per-customer basis, rather than in the aggregate, including industrial customers creates significant problems due to the heterogeneity of the customers within the class. Unlike the case of the residential class, there is no typical industrial customer. As such, implementing a per-customer approach when industrial customers are included creates significant challenges.

Others suggest that all classes should be subject to whatever mechanism the Commission might implement in this regard. One argument along these lines is that the cost of new supply-side assets is spread to all ratepayers. Symmetry argues for consistent treatment of demand-side resource costs, these people suggest.

The one conclusion that seems most relevant here is that if a customer class truly is excluded from efficiency programs, then its responsibility for recovery of efficiency programs could be limited by the Commission. Therefore, if energy efficiency opportunities are slanted toward particular classes, it may make sense to allocate cost responsibility for those programs in a

manner that reflects that situation. This could include not only programs costs, but any lost revenue or incentive payments that are associated with energy efficiency programs.

The Commission will have to apply its judgment in determining which customers should bear responsibility for efficiency-related costs. As with other cost allocation problems, there is no one right answer here.

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